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The spatiotemporal distribution and polymer composition of microplastics in the Ishmi River in Albania

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Abstract
In recent years, research on microplastics in rivers has undergone rapid expansion, resulting in the revelation of widespread contamination and the subsequent emergence of concerns regarding ecological and human health impacts. A multitude of studies have confirmed the presence of microplastics in European rivers, with microplastic density demonstrating seasonal variations. The reported concentrations of microplastic in surface waters vary considerably, ranging from as low as 0.03 particles per cubic meter up to extreme values of nearly 187,000 particles/m^3. The presence of microplastic pollution in Albania's freshwater systems represents a novel and growing concern. Albania has not yet established a comprehensive river estuary cleaning system, incorporating automated stations or permanent structures. Current initiatives are predominantly pilot investments from voluntary and non-governmental organizations. The objective of this study is to investigate the spatiotemporal distribution and polymer composition of microplastics in the Ishmi River, which drains the Tirana-Fushe Kruja region with a delta into the Adriatic Sea.
Surface water samples were collected at six stations along the Ishmi River in a two-time sampling calendar, September 2024 and March 2025. It is noteworthy that microplastic levels exhibited an increase at four of the six stations between 2024 and 2025, with the highest concentration (~4 particles/m^3) being recorded at a mid-river station situated in proximity to urban areas in 2025. Polymer analysis revealed a diverse mix of plastics; polyethylene, polystyrene and polypropylene fragments, film and synthetic fibers were commonly identified. These results indicate that microplastic pollution in Ishmi River is significant and appears to have worsened over time, likely driven by urban runoff and inadequate waste management. The findings emphasize the necessity for ongoing monitoring of Albanian rivers and the implementation of mitigation measures, such as enhanced waste management and wastewater treatment, to minimize plastic inputs. A comprehensive reduction in land-based plastic pollution will contribute to the preservation of riverine and coastal ecosystems downstream.

Key words: microplastics, spatiotemporal distribution, polymer, river water, waste management.

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